Burke, A.C. The eval of a planned program to develop number concepts in the Kindergarten 1947

THE EVALUATION OF A PLANNED PROGRAM TO DEVELOP NUMBER CONCEPTS IN THE KINDERGARTEN

by

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SCHOOL OF EDUCATION

Thesis

THE EVALUATION OF A PLANNED PROGRAM TO DEVELOP NUMBER CONCEPTS IN THE KINDERGARTEN

by

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INTRODUCTION

The purpose of this study is to evaluate a planned program to develop number concepts in the kindergarten.

Because of the many and varied number opportunities which arise in the course of the kindergarten year, and because various studies indicate a definite need for a greater emphasis on the development of number readiness in the kindergarten, the writer, a kindergarten teacher, felt a study of this kind might aid in directing, expanding and extending a number readiness program.

CHAPTER I

SUMMARY OF PREVIOUS RESEARCH

Number Knowledges of Children

Preschool. Despite the fact that there are many studies to ascertain the number knowledges of preschool children, no standard attainment of number concepts can be assumed because of the individual differences in experiential background.

Brownell[1] says that the research on the arithmetical knowledge and skills of children just entering school is impressive, both in its extent and in the facts which it has revealed, even though the studies are open to question on one ground or another.

Smith[2] finds that preschool learning is acquired by a variety of experiences in the home, at play with older children attending school, in games involving counting, and by errands to the grocery store.

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[1]Brownell, William A., Arithmetic in Grades I and II, Duke University Research Studies in Education, Number 6, Duke University Press, Durham, North Carolina, 1941, 175 p.

[2]Smith, Nila B., "An Investigation of the Uses of Arithmetic in the Out-of-School Life of First Grade Children", Elementary School Journal, Vol. 24, pp. 621-626, April, 1924.

Douglass[1] tested children fifty-four to seventy-two months of age and reveals they have accurate concepts of 1, 2, 3, and 4, but vague concepts of 5, 6, 7, 8, 9, and 10. His test consisted of the recognition of a number of dots in patterns of different sizes, selecting certain patterns as representing the numbers announced by the experimenter, and estimating the number of marbles exposed momentarily by the experimenter.

The results of Kent's[2] School Entrance Test for five year olds, which includes several questions relating to number, showed the correct responses of the first one hundred children.

Which is larger, a cat or a kitten?	67%
Which is larger, a horse or a dog?	71%
Which is larger, a cow or a sheep?	61%
At what time of year do we go swimming?	59%
At what time of year is it very cold?	62%
Does the Fourth of July come in summer or winter?	52%
Does Christmas come in winter or in summer?	65%
If today is Sunday, what will tomorrow be?	30%
How many wheels has a wheelbarrow?	58%
How many wheels has a scooter?	79%

Many of these questions depend on the child's background as indicated by the percentage of correct responses. The concept of time, space, and measure do not interest the child at this

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[1]Douglass, Harl R., "The Development of Number Concepts in Children of Preschool and Kindergarten Ages", Journal of Experimental Psychology, Vol. 8, pp. 443-470, December, 1925.

[2]Kent, Grace, "The 'Andover' School-Entrance Test", Journal of Educational Psychology, Vol. 35, p. 150, February, 1944.

time, as shown by this test and other research findings.

Riess[1], from personal observation, traces the growth of number concepts from the pre-numerical behavior at eleven months, through the naming and ordering stages, to the recognition of the basic principles of number behavior at school age.

Stotlar's[2] study with nineteen preschool children fifty to sixty-nine months indicates a definite consciousness of number before entering school, real and out-of-school uses for number, and a positive need for the provision of number experiences in school. In her conclusions, she states 70 per cent of the children tested counted to ten or higher by rote, and 70 per cent counted to ten or higher by concept, showing that rote counting and number concept are advancing at the same rate. In repeating numbers (a test taken from the Stanford Binet Intelligence Test for ages 4 years 6 months to 7 years), 7 children were at the 7 year level, and only 2 fell below the level of 4 years and 6 months.

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[1]Riess, Anita, "An Analysis of Children's Number Responses", Harvard Educational Review, Vol. 13, pp. 149-162, March, 1943.

[2]Stotlar, Carolyn, "Arithmetic Concepts of Preschool Children", Elementary School Journal, Vol. 46, pp. 342-345, February, 1946.

Kindergarten. Connor's[1] study of 1242 children in a Cleveland kindergarten consisted of rote and rational counting, recognition of number groups, thought problems, and addition combinations. Of the 313 kindergarten children taking the test on rote counting, 97 per cent counted to ten, and 76 per cent to twenty. Only 26 per cent of 1242 children enumerated objects through five. The discrepancy here was due to the fact that the children not only selected the correct number of tacks, but also had to put them into a board.

In presenting five number combinations concretely, the percentage of correct responses ranged from 37 per cent for the combination 2 + 8 to 66 per cent for the combination 2 + 2. When the number combinations were presented in verbal problems, the percentages of correct responses ranged from 30 per cent for the combination 7 + 1, to 48 per cent for the combination 5 + 1. As Brownell[2] points out, the percentage of correct responses does not mean that the children knew the facts, but rather that they were able to get the answers, or, were able to handle the combinations as they were presented.

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[1] Connor, William, A Study of the Kindergarten Achievement Testing in Arithmetic, Bureau of Educational Research Bulletin, Number 6, Board of Education, Cleveland, July 29, 1929.

[2] Op. cit. p. 37.

Buckingham and MacLatchy's[1] study of 1356 school entrants in Texas and Ohio reveals 90 per cent counted by rote to ten, and also could enumerate through ten. Seventy-two per cent identified or named the number of objects in groups of various sizes. Seventy per cent reproduced a number of objects upon request. With respect to number combinations presented concretely, the visible test was more successful. The percentages ranged from 72 per cent to 89 per cent for ten combinations. Another sub-test showed results with respect to number combinations presented in verbal problems. Seventy-two per cent made correct responses to the combination 5 + 1, but only 22 per cent made correct responses to the combination 4 + 5.

A similar study by Buckingham and MacLatchy is described by Brownell[2]. This study involved 1067 children in Cincinnati, two thirds of whom were kindergarten trained. Brownell compared the results of their two tests with respect to kindergarten trained and non-kindergarten children. In rote counting by 1's to one hundred, the median for the kindergarten group is 29.3, and 19.1 for the non-kindergarten group. Seventy per cent of the kindergarten group enumerated twenty objects correctly,

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[1]Buckingham, B. R., and MacLatchy, J. H., Number Abilities of Children When They Enter Grade One, Report of the Society's Committee on Arithmetic, 29th Yearbook, National Society for the Study of Education, Bloomington, Illinois, Public School Publishing Co., 1930, pp. 473-524.

[2]Op. cit. pp. 15-42.

compared with 47 per cent of the non-kindergarten group. The responses are more successful with the kindergarten trained children in reproducing and identifying numbers of objects in a group. The kindergarten group also excelled in the addition combinations. However, it must be pointed out that the average mental age of the kindergarten children in this test was 6 years 6 months, as compared with a mental age of 5 years 10 months for the non-kindergarten children.

In neither of these studies is there any mention of comparison, quantitative vocabulary, fractions, or measurement.

Woody's[1] test with ninety-four kindergarten children consisted of rote counting, telling time, fractions, and addition combinations. He makes five conclusions to his study.

1. Children possess much ability in the elementary processes of arithmetic, even before the time of beginning formal instruction in the subject.

2. Children's knowledge is not limited to counting and adding simple combinations, but includes elementary knowledge of fractions, United States money, units of various types of measurement.

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[1]Woody, Clifford, "The Arithmetical Backgrounds of Young Children", Journal of Educational Research, Vol. 24, pp. 188-201, October, 1931.

3. Extended inventory tests designed not only for throwing light on the goals of achievement, but also upon the methods employed in attaining the goals should be given before the beginning of formal instruction, if instruction is to be adapted to the needs of the individual child.

4. The method of attaining a solution must be taken into consideration in interpreting the significance of a given attainment.

5. A small but persistent tendency exists for boys to make a slightly greater percentage of correct responses to tests as a whole and to individual items of the test than the girls.

Hildreth's[1] study reveals the differences between two groups totaling one hundred children to whom she administered the Metropolitan Readiness Test in kindergarten. A year and a half later she gave a special arithmetic test designed for the program of instruction to one group of twenty-six children. The correlation coefficient is .50. Two and a half years later, the other group numbering thirty-three took the arithmetic test, and the correlation is .58. Brownell[2] says,

> "Neither coefficient suggests much usefulness for this particular readiness test as a means of predicting achievement, however valuable it may be for inventorying purposes....Hildreth does not mention the fact that to be most effective the readiness test must be closely keyed to the program of instruction which is to follow."

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[1]Hildreth, Gertrude, "Number Readiness and Progress in Arithmetic", Journal of Experimental Education, Vol. 4, pp. 1-6, September, 1935.

[2]Op. cit. p. 57.

Russell[1] reports in his findings from studies with twenty-three kindergarten children that "manyness" is the first quantitative concept, that cardinal and ordinal concepts develop together, that counting is not a reliable measure of this development, and also that children under five years understand "most", "both", "biggest", but not "same", and "equal".

In Ray's[2] study of twenty-one kindergarten children, 75 per cent counted objects up to ten, recognized the simple geometric forms, recognized small and large groups, divided an object in halves, knew the meaning of the word "middle", knew the difference between "largest" and "smallest, and recognized the quart milk bottle. Between 10 and 25 per cent of the group made correct responses to questions relating to time and money concepts. She lists several implications for education - units on counting, counting games, block work for geometric figures, and a milk unit.

In making a study of out-of-school knowledge of number, Rogers[3] reports findings for twenty-two kindergarten children in 1937 and twenty children in 1938. As a result of the study,

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[1]Russell, Ned, "Arithmetical Concepts of Children", Journal of Educational Research, Vol. 29, pp. 647-663, May, 1936.

[2]Ray, Ethel, "Arithmetic Readiness in Kindergarten and the Primary Grades", Unpublished Ed. M. Thesis, Boston University, 1938.

[3]Rogers, Gertrude, "Provide Aid and a Possible Method for Determining Problem Units in Arithmetic", Unpublished Ed. M. Thesis, Boston University, 1939.

she suggests that the kindergarten build up number experiences and a number vocabulary through various kinds of units and activities. Again in this study, the children possessed little ability in concepts of time and money.

Brownell[1] reports a study on arithmetic readiness of beginning first grade children from twenty-four schools in Florida, North Carolina, Pennsylvania, and Virginia. The instrument which was used in this test was the series of pre-tests published in connection with the "Jolly Numbers" primary materials of the "Daily-Life Arithmetics". In all, 365 rural and 327 city pupils were included in this study. He summarizes data from twelve separate investigations relating to twelve different arithmetical topics in conjunction with his own study. Among the studies he summarizes are those of Buckingham and MacLatchy[2], Connor[3], Woody[4], and Grant[5].

In Brownell's[6] study, 90 per cent of the children counted by rote to ten, and 89 per cent enumerated through ten. In making crude quantitative comparisons with concrete objects or

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[1]Op. cit. pp. 12-44.

[2]Op. cit. pp. 473-524.

[3]Loc. cit.

[4]Op. cit. pp. 188-201.

[5]Grant, Albert, "An Analysis of the Number Knowledge of First Grade Pupils according to Levels of Intelligence", Journal of Experimental Education, Vol. 8, pp. 63-66, September, 1938.

[6]Loc. cit.

pictures, less than one half of the children taking the test knew all the eleven terms. Three quarters of them identified six or seven terms and nine out of ten identified at least five. The best known terms were "most"and "largest", the least well-known terms "fewest" and "smallest".

In testing the ability to compare abstract numbers, the procedure was to ask which of two given numbers is "more", and which of two other numbers is "less". Eighty-three per cent made correct comparisons for "more", and 45 per cent for "less".

In summarizing this study, Brownell[1] states that city children surpass rural children rather consistently, but the difference is not large. Reasons for it lie in unlike experiences having their origin in unlike environments. There is also a positive relation between intelligence on the one hand, and various arithmetical abilities on the other hand. With respect to kindergarten, he finds a far greater ability on the part of kindergarten children who took the tests than those who did not take the tests.

Some of the significant data in Grant's[2] study is summarized by Brownell[3]. The results of testing 166 bright pupils with an IQ of 110 in their knowledge of ordinal "third" is 71 per cent

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[1]Op. cit. 43-44.

[2]Loc. cit.

[3]Op. cit. pp. 20-50.

correct responses, and of ordinal "sixth", 67 per cent correct responses. With the same group in the recognition of geometric forms, 92 per cent knew the square, 85 per cent knew the circle, and only 34 per cent knew the triangle.

Carper[1] tested forty-eight five year old kindergarten children in group concept. Seventy-seven per cent recognized groups of geometric figures in outline. However, more complex arrangements of the figures in picture drawings reduced the percentage of correct performance considerably. In another test, pictures rather than geometric forms were shown. Twenty-nine per cent performed correctly. She states that an implication for education is the need for a more systematic teaching of the concept of groups.

Wittich[2] conducted a "Number Readiness Test" for seventy-six beginning first grade pupils, ages sixty-five to eighty-four months. The test included abstract and concrete counting, writing numbers, addition and subtraction combinations, and fractions. All the children could count to ten. Forty-one children wrote numbers one to ten. A large percentage knew many of the number combinations as well as the fractions. He concludes

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[1]Carper, Doris, "Seeing Numbers as Groups in Primary Grade Arithmetic", Elementary School Journal, Vol. 43, pp. 160-170, November, 1942.

[2]Wittich, Walter, "A Number Readiness Test", School Executive, Vol. 61, pp. 11-13, March, 1942.

that the children possess arithmetical concepts far beyond what is ordinarily anticipated. He suggests many concept building experiences which occur in the average classroom.

Mott's[1] pre-primary test of forty-four children, ages thirty-four to seventy-three months, showed at the four and five year level 90 per cent counted to ten, and 92 per cent enumerated through ten. The numbers 1, 2, 4, 5, and 10 were most clear and definite. Seventy-two per cent recognized the first five ordinals and 64 per cent reproduced them. Eighty-six per cent attacked the problem of finding a number in a group in a one by one pattern. She indicates the fact that rote counting is not a necessary prelude to object counting, for almost one half of the children in this test counted objects beyond their rote counting. Her findings also indicate that small children think aloud, but as they grow older they use the silent approach.

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[1] Mott, Sina, "Number Concepts of Small Children", The Mathematics Teacher, Vol. 38, pp. 291-301, November, 1945.

In conclusion, a classification of research findings in three categories is given by Brownell[1].

1. Skills and concepts quite well developed by the time most children start school:

   Rote counting by 1's through 20.
   Enumeration by 1's through 20.
   Identification through 10.
   Crude comparisons
      (a) With objects: concepts of largest, middle, most, shortest, smallest, tallest, widest.
      (b) With abstract numbers: "more" with numbers through 10.
   Exact comparison or matching to 7.
   Number combinations
      (a) With objects: to sums of 10.
      (b) In verbal problems with easily imagined objects and situations: adding 1 and 2, and probably most facts with sums to 6 or 7.
   Fractions: unit fractions through halves and fourths as applied to single objects, and perhaps halves as used with small groups in even division.
   Ordinals: through sixth.
   Geometric figures: circle and square.
   Telling time: at the hour.
   U.S. coins: recognition of all coins to the half dollar, and some understanding of relative values of pennies and other smaller coins.

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[1]Op. cit. pp. 58-59.

2. Skills and concepts not so fully known to school entrants, but are fairly well started among a reasonably large per cent of children of this age.
   - Rote counting by 1's to 100.
   - Rote counting by 10's to 100.
   - Rote counting by 2's to 20.
   - Crude comparisons
     - (a) With objects: as long as, fewest.
     - (b) With abstract numbers: "less" and numbers to 10.
   - Number combinations
     - (a) In verbal problems: probably all the facts with sums to 9 or 10.
     - (b) With abstract numbers: less than 50% able to deal successfully with easiest facts.
   - Reading numbers: only a few know the numerals to 10.

3. Skills and concepts possessed by less than a third of school entrants.
   - Rote counting by 3's to 30.
   - Crude comparison of objects: "same", or "equal".
   - Fractions: proper, improper fractions, relative size of fractions.
   - Reading and writing numbers: no ability beyond 10 to read; none to write, even to 10.
   - Geometric figures: triangle.
   - Telling time: at the half and quarter hour.
   - U. S. money: relative value of coins other than pennies.
   - Liquid and linear measure: relative size of units.

Arithmetic Readiness in Kindergarten

Importance. Buckingham[1] states, "The question of number learning in the early stages depends in part on the so-called "law of readiness".

According to Sueltz[2] the factors involved in arithmetic readiness are physical and mental maturity to interpret an experience or to sense a situation, and the ability to discriminate size, quantity or magnitude. He believes, after some informal work with five and six year olds, that number concepts should be fairly well formed before the reading and writing stages. He suggests the possibilities of a curriculum that features informal oral and mental development of concepts and principles leading to number facts without the complicating use of paper and pencil.

In another article Sueltz[3] indicates that activity and social experiential education are well suited to the arithmetic of the kindergarten, and shows the importance of developing the fundamental number concepts at this level.

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[1]Buckingham, B. R., "How Much Number Do Children Know?" Educational Research Bulletin, Vol. 8, pp. 279-284, September, 1929.

[2]Sueltz, Ben, "Arithmetic Readiness and Curriculum Construction", The Mathematics Teacher, Vol. 30, pp.270-275, October, 1937.

[3]Sueltz, Ben, "Recent Trends in Arithmetic", The Mathematics Teacher, Vol. 33, pp. 270-275, October, 1940.

Suggestions for teachers. In many research findings, systematic instruction in number concepts as soon as the child enters school is stressed. Dickey[1] says that the experienced teacher, aware of the problems of arithmetic readiness and concepts involved, is the key to the situation.

Hooper[2] says that the role of the teacher is to see that the activities in which the child is engaged are of such a nature that he is growing in his ability to cope with his own problems.

MacLatchy[3] believes teachers are not skillful in detecting weaknesses in early number understanding, that the beginning instruction is too abstract. She stresses the importance of the need for many repetitions in the child's number experiences in many different ways or combinations. Whiteaker[4] and Riess[5] also emphasize the importance of repetition.

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[1]Dickey, John W., "Readiness for Arithmetic", Elementary School Journal, Vol. 40, pp. 592-598, April, 1940.

[2]Hooper, Laura, and Stratton, Barbara, "Developing Number Concepts with Young Children", Educational Method, Vol. 16, pp. 193-198, January, 1937.

[3]MacLatchy, Josephine, "Seeing and Understanding Number", Elementary School Journal, Vol. 45, pp. 144-152, November, 1944.

[4]Whiteaker, George, "A Child's Concept of Numbers", The Mathematics Teacher, Vol. 32, pp. 25-26, January, 1939.

[5]Riess, Anita, "The Meaning of the Meaningful Teaching of Arithmetic", Elementary School Journal, Vol. 45, pp. 23-32, September, 1944.

Brueckner[1] believes a well organized readiness program has carefully selected rich social experiences which will give the child insight into number processes, so that the formal work he will do may be significant and vital for him. He makes many suggestions for an enriched curriculum to develop number concepts.

Bentley's[2] study with sixty-seven kindergarten children over a period of two years suggests many units of activity relating to number concepts in the course of the kindergarten year.

Langdon[3] describes the similarities and differences in the teaching of number concepts in nursery school, kindergarten and first grade. She outlines the teaching acts at each level with the mean ratings. The nursery school considers most important those acts having to do with quantitative terms. The kindergarten develops concepts of space, time, distance, quantity and the beginnings of skill in counting.

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[1]Brueckner, Leo J., "Readiness in Arithmetic", Readiness for Learning, Association of Childhood Education, Washington, D. C., 1941, 35 p.

[2]Bentley, E. Mae, "Working out Number Opportunities which can be Developed Meaningfully with a Typical Kindergarten Class", Ed. M. Thesis, Boston University, 1938.

[3]Langdon, Grace, "Similiarities and Differences in Teaching in Nursery School, Kindergarten and First Grade", The John Day Company, New York, 1933, 392 p.

Arithmetic Readiness Tests. There are no standardized arithmetic readiness tests at the kindergarten level. The tests in the various research studies are inventory tests, in each case devised for the particular community in which it was given.

Courses of Study. The courses of study in Boston, Newton, Springfield, New York, Chicago, Tulsa, Los Angeles, Long Beach, and Houston have programs of arithmetic readiness for the kindergarten level. Many suggestions are made for the development of concepts of time, measure, form, money and number. The development of an adequate number vocabulary is emphasized.

The International Kindergarten Union List[1] contains many words relating to number which children know before entering first grade.

On the basis of this evidence, the writer evaluated a planned program for developing number concepts in the kindergarten.

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[1]Child Study Committee of the International Kindergarten Union, A Study of the Vocabulary of Children before entering the First Grade, Baltimore, 1928.

CHAPTER II

THE PLAN OF STUDY

In order to evaluate a planned program for developing number concepts in the kindergarten, it was necessary to

1. Plan a program.
2. Select a population.
3. Build and administer a test of number concepts.

Program. A study of the kindergarten programs in various cities throughout the United States, and the many suggestions made by leading educators in research articles afforded much help in the planning and the developing of this program. The International Kindergarten Union List[1] was consulted for the development and enrichment of the number vocabulary. The daily program given below with the time allotment for each activity was kept as far as possible within the planned schedule.

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[1] Loc. cit.

Daily Program

Activity	A. M.	P. M.
Free Choice	8:45 - 9:15	1:15 - 1:30
Songs	9:15 - 9:40	1:30 - 1:50
Health	9:40 - 9:50	1:50 - 2:00
Rhythms	9:50 - 10:05	2:00 - 2:10
Rest	10:05 - 10:15	2:10 - 2:20
Lunch	10:15 - 10:30	2:20 - 2:30
Work	10:30 - 11:15	2:30 - 3:05
Games, Dances, Orchestra	11:15 - 11:30	3:05 - 3:15
Outdoor Play	11:30 - 11:45	
Story, Poetry, Picture or Nature Study	11:45 - 12:00	3:15 - 3:30

The program for developing number concepts was devised at the beginning of the year. Every opportunity to introduce number vocabulary and number concepts was used. The complete outline for September follows.

September

1. Free Activity

Picture Books - turn pages from front cover to back cover.

Toys - different sizes

Pegs, sticks, beads - size, form, number

Plasticene - form

2. Morning Circle

Note different sized chairs - three heights

Little children - low chairs

Medium sized children - medium sized chairs

Tall children - high chairs

Attendance - teacher and children count children present.

Count all the children.

Count the boys.

Count the girls.

Place the number present and absent on the blackboard.

Day of week noted - also weather

Songs

Humpty Dumpty - all - pairs of horses in dramatization

Diddle Diddle Dumpling - one by one

Little Miss Muffett - down, beside

Hickory, Dickory, Dock - up, down, one o'clock

Wee Willie Winkie - up, down, seven o'clock, bedtime

Sing a Song of Sixpence

Count out twenty-four blackbirds.

King counts out real pennies.

My Pigeon House - form circle and count out a number of birds.

The Family -

A child tells the number in family.

Teacher makes the family.

Later the child makes the family.

In a Milkweed Cradle - form a circle and count out seeds.

Finger Play

Tommy Thumb - fingers on each hand, numbers 5 and 10.

Here's a Ball - three sizes

Here's a Ball for Baby - big, round

This Little Pig - five fingers

Five Little Squirrels - five fingers

Clapping to music and without music - teacher claps a number of times-children tell the number or imitate by clapping.

Note number in materials contributed by the children.

Nuts, leaves, milkweed, pictures

3. Health

Take positions in line for washroom.

Choose leaders by counting to a certain number.

Note partners and left-overs.

4. Rhythms

Skipping - first one foot, then the other.

Marching - forward, one behind the other

Walking - with and without partners

Tiptoe - high on toes

Bounce ball - count number of bounces.

5. Lunch

Count napkins, cookies - note form of both.

Save milk caps for use in making constructive toys.

Fruit cut in halves and quarters.

6. Work

Before work -

Note that children sit at high or low tables depending on the height of the chairs.

Assign cupboard to each child - top, middle or bottom shelf, or first, second or third shelf.

Children distribute material, or help themselves.

Vocabulary - not enough, left-over, one to each, enough, need more, one more

At work

String beads - form, number

Square, round, cylinder

Groupings as far as 7

Pegs - two sized boards

Blocks - note form, size, length, weight

Note height of towers, buildings.

Compare size of buildings.

Paper -

Drawing - label all pictures noting number in them.

Folding - square and oblong paper

Fold paper in halves - a book

Fold paper in quarters - a handkerchief

Cutting - circles, squares of different sizes

Parquetry - form, size, color

Note parquetry kept in decorated egg box.

Children make balloons, lollipops, tops, flowers.

Plasticene - note form and size

7. Games

Roll the Ball - each child has one turn if ball rolls near him.

Ball in the Basket or Box - note difference in depth of each

Six worsted balls in a row - remove one at first while child is blindfolded. Then remove two etc. The child tells the number of balls taken away.

Spin the Cover - to choose leaders, or to choose a game.

Round We go - form circle - up, down, in, out

Snail Game - first, last, nearer, farther

Five Little Chickadees - take away one at a time.

My Pigeon House - any number fly away

Here We Go Round the Mulberry Bush - days of week

Farmer in the Dell - eight children play

Ring Toss - form, number

Follow Directions - put one ball on floor and one ball on table - increase number

8. Story

The Three Bears - three sizes

The Three Kittens - number

The Three Pigs - number

Fuzzy Wuzzy Ducklings - number

9. Poetry

Mother Goose

Simple Simon - a penny

Three Wise Men of Gotham - number

This Little Piggy and other Counting Rhymes

Counting Rhymes

The Snail - longest, shortest, thick, tall

10. Nature Study

Leaves, nuts, milkweed

11. Picture Study

Family - children, animals, birds

12. Excursion - through the school building

Note number of floors.

Note number system on the doors.

Note number on the kindergarten door.

Children's Leads

Nature material

New Watch

Note minute and second hands.

Count to sixty watching the watch and then the wall clock.

Picture book - Make Way for Ducklings - number

Children observe the school bells.

Recess bells - one long ring

Doctor's bell - two short rings

Dismissal bell - one long ring

The complete outline for the year may be found in the appendix[1].

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[1]p. 44.

Selection and Status of the Population. Forty-seven children were included in the experimental group, twenty-four of whom attended kindergarten in the morning and the remainder in the afternoon. There were also forty-seven children included in the control group with the same number attending each session. In February, the morning and afternoon classes are alternated, so that every child attends kindergarten for a half year in the morning, and the other half year in the afternoon. Each group attended different schools, but in the same district. The children in each group had comparable social and economic status.

The mental age was obtained from the Pintner-Cunningham Primary Test[1] which was administered in October to both groups.

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[1]Published by World Book Company, 1938.

Table I shows the mean chronological and mental ages for both groups.

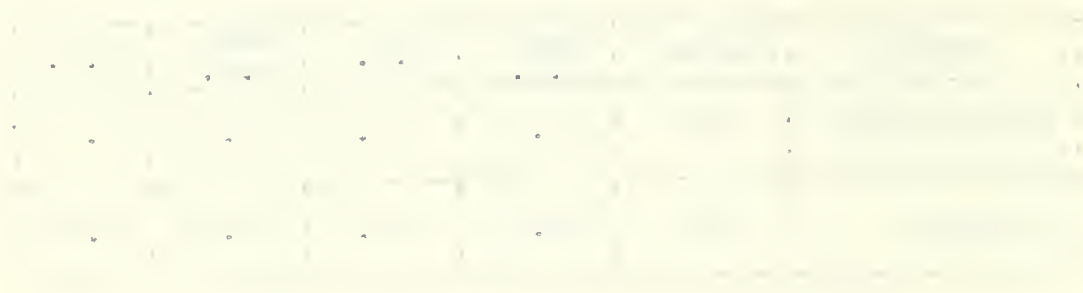
TABLE I

Mean Chronological and Mental Ages

Group	Number	Mean C.A.	S.D.	Mean M.A.	S.D.
Experimental	47	57.36	10.3	61.31	6.
Control	47	59.22	10.3	62.69	7.9

The mean mental age for the experimental group is sixty-one months compared with sixty-two months for the control group. The mean chronological age for the experimental group is 57.3, two months lower than the mean chronological age for the control group which is 59.2.

The mental ages of the experimental group range from forty-nine months to seventy-eight months, and the control group from forty-nine months to eighty-four months. The chronological ages of the experimental group range from fifty-two months to sixty-five months, and the control group from fifty-one months to sixty-five months. Both groups were above average mentally.



Construction of the Arithmetic Readiness Test. In order to evaluate the planned program, a test was constructed after detailed study of the following:

1. Classification of research findings by Brownell[1].
2. Inventory tests.
3. Suggestions in research, texts, and courses of study.

The test is divided into two parts, individual and group. The time required for total administration is about a half hour, five minutes for the Individual Test and twenty to twenty-five minutes for the Group Test. The items that were given individually were those that could not be successfully illustrated or answered in the group test.

Part I - Individual

Each child is asked to tell his address, age, birthday, the day of the week and the number of days in the week. These knowledges are included in many courses of study and in some inventory tests.

The child is also asked to count by rote to twenty and to count twenty pennies. Brownell[2] says rote and rational counting through twenty are well-developed by the time most children

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[1]Op. cit. p. 58.

[2]Loc. cit.

enter school, so that particular number was decided upon.

The identification of coins through the half dollar, and the value of 1¢, 3¢ and 5¢ stamps are two other items in the individual test. The identification of the penny, nickel and dime are among the number concepts in the Boston Course of Study. The latter suggestion together with Brownell's[1] finding that children recognize coins to the half dollar resulted in this test item. The identification of stamps was included because of the many uses of stamps in the planned program.

Part II - Group

Test 1. Identification of numbers 5, 7, 10.

The children are asked to identify the five soldiers marching together, the boy holding seven balloons, and the ten stars grouped together.

Test 2. Reproduction of numbers 6, 8, 9.

The children are to draw six windows in the house, eight candles on the cake, and nine balls beside the girl.

The findings of Douglass[2], Mott[3], and Brownell[4]

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[1]Loc. cit.

[2]Op. cit. pp. 443-470.

[3]Op. cit. pp. 291-301.

[4]Loc. cit.

suggested the use of these specific numbers through ten.

Test 3. Quantitative Comparisons

In this test the children are to mark one of three pictures in each item. The following words are used in the test.

most	as long as	largest
longest	same	smallest
shortest	different	tallest
widest	more	nearest
deepest	less	farthest

The Kindergarten Union List[1] does not include superlatives, but Brownell's[2] classification and the constant use of superlatives in the program warranted the use of them in the test.

Test 4. Geometric Figures

The children are asked to identify the circle, square, triangle, and oblong. The terms of arrangement, "over", "under", and "center" are a part of the directions. The Tulsa Course of Study uses these terms and they are also on the Kindergarten Union List[3]. The identification of the square, circle and triangle are used by Ray[4],

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[1]Loc. cit.

[2]Loc. cit.

[3]Loc. cit.

[4]Loc. cit.

Grant[1], and Carper[2]. The latter used the figures in outline and more complex arrangements. The oblong was included in the test because of its extensive use in the program.

Test 5. Terms of Arrangement

A check on the knowledge of geometric figures is made in this test when the children are asked to draw each figure in a particular place. The following words are used:

right
left
top
middle
bottom

These terms are in the Tulsa Course of Study and the Kindergarten Union List.[3]

Test 6. Exact Comparison (matching)

The children are to draw as many nuts under the second squirrel as there are under the first squirrel. Only two numbers "5" and "7" are compared or matched in this test. The term "as many as" is tested also. Brownell's[4] classification suggested these items.

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[1]Op. cit. pp. 63-66.

[2]Op. cit. pp. 160-170.

[3]Loc. cit.

[4]Loc. cit.

Test 7. Fractions

The apples are to be divided into halves and quarters. The flowers and the dolls are to be evenly divided. "Half" and "quarter" as applied to single objects are items in many inventory tests and "halves" as used with small groups in even division is an item in Grant's[1] test.

Test 8. Ordinals

This test includes ordinals "first","second", "third", "fourth", "fifth", and "sixth". In Mott's[2] test the children recognized and reproduced the first five ordinals. Grant's[3] study includes ordinal "sixth". "First" and "second" are the only two ordinals on the Kindergarten Union List[4]. The Tulsa Course of Study lists ordinals "first" to "fourth".

Test 9. Time

The children are asked to mark the clocks which show schooltime, noontime, and bedtime. These items were suggested by the Houston and Los Angeles Courses of Study.

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[1]Loc. cit.

[2]Loc. cit.

[3]Loc. cit.

[4]Loc. cit.

Test 10. Value of Money

The children are to mark one of three objects which they could purchase with a penny, a nickel, and a dime. Ray[1] and Rogers[2] included tests of this nature in their studies. Brownell[3] indicates the child entering school has some understanding of the value of pennies and other small coins.

Test 11. Measure

The identification of quart, pint and half pint are included in this test. The children are also asked to identify the dozen eggs. These items were suggested by the Tulsa and Houston Courses of Study.

Test 12. Number Combinations

Three verbal problems in addition and three in subtraction are to be solved by the children. The children listen to each problem and then mark the number of objects in each item. Brownell's[4] classification includes number combinations in verbal problems with easily imagined objects and

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[1]Loc. cit.

[2]Loc. cit.

[3]Loc. cit.

[4]Loc. cit.

situations, adding one and two and probably most facts, with sums to six or seven.

The test was in mimeographed form. A complete copy of the test with directions for administering and scoring may be found in the appendix[1].

Program of Study. The program as outlined was carried on in the two classes which comprised the experimental group. The writer taught both of these classes. The control group had no planned program.

In May the test of number concepts was administered to all of the children. The results of these tests were analyzed and the data is presented in the next chapter.

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[1]p. 84.

CHAPTER III

ANALYSIS OF DATA

The data were analyzed to study the effect of a planned program to develop number concepts in the kindergarten.

The following relationships were studied:

1. The total test results of the experimental and control groups.
2. The "Group Test" results of the experimental and control groups.
3. The "Individual Test" results of the experimental and control groups.
4. Sex differences in achievement in the experimental group.
5. Sex differences in achievement in the control group.

Table II shows the results of the total test.

TABLE II

Total Test Scores

Group	Number	Mean	S.E.M.	S.D.	Diff. M.	S.E. Diff.	C.R.
Experimental	47	56.86	1.46	9.99	15.18	2.44	6
Control	47	41.68	1.95	13.41			

The mean score of the experimental group was 56.86 compared with 41.68 for the control group. The critical ratio was 6, a statistical significant difference in favor of the experimental group.

Table III shows the results of the group test.

TABLE III

Group Test Scores

Group	Number	Mean	S.E.M.	S.D.	Diff. M.	S.E. Diff.	C.R.
Experimental	47	43.53	1.31	9.	9.08	2.10	4
Control	47	34.45	1.64	11.22			

The mean score of the experimental group was 43.53 compared with 34.45 for the control group. The critical ratio was 4, a statistical significant difference in favor of the experimental group.

Table IV shows the results of the individual test.

TABLE IV

Individual Test Scores

Group	Number	Mean	S.E.M.	S.D.	Diff. M.	S.E. Diff.	C.R.
Experimental	47	12.10	.44	3.	5.	.64	7
Control	47	7.10	.46	3.16			

The mean score of the experimental group was 12.10 compared with 7.10 for the control group. The critical ratio was 7, a statistical significant difference in favor of the experimental group.

Table V shows sex differences in achievement in the experimental group.

TABLE V

Sex Differences in Achievement

Experimental Group

Sex	Number	Mean	S.E.M.	S.D.	Diff. M.	S.E. Diff.	C.R.
Boys	27	57.32	1.82	9.48	2.92	2.77	1.00
Girls	20	54.40	2.09	13.07			

The mean score of the boys is 57.32 as compared with 54.40 for the girls in the experimental group. The critical ratio of 1.00 showed this difference is not statistically significant. There are 68 chances in 100 that this is a true difference in favor of the boys.

Table VI shows sex differences in achievement in the control group.

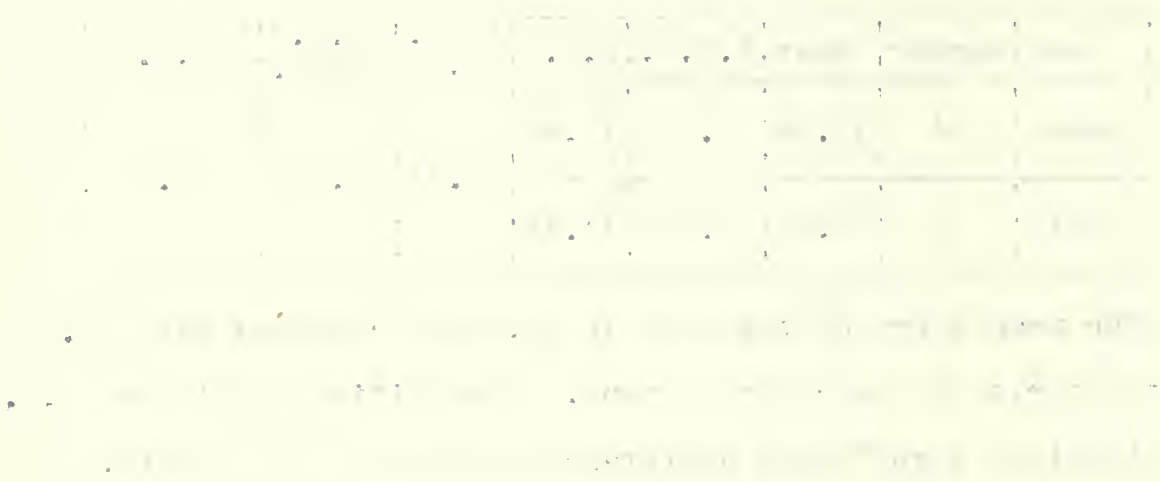
TABLE VI

Sex Differences in Achievement

Control Group

Sex	Number	Mean	S.E.M.	S.D.	Diff. M.	S.E. Diff.	C.R.
Boys	24	35.24	2.33	11.40	12.71	3.31	3.8
Girls	23	47.95	2.39	11.49			

The mean score of the boys is 35.24 as compared with 47.95 for the girls in the control group. The critical ratio was 3.8, a statistical significant difference in favor of the girls.



CHAPTER IV

SUMMARY AND CONCLUSIONS

The purpose of this study was to evaluate a planned program to develop number concepts in the kindergarten.

The program was devised at the beginning of the year and carried on in the two classes of forty-seven children which comprised the experimental group. The control group which also numbered forty-seven had no planned program. Each group attended different schools, but in the same district. The children in each group had comparable social and economic status. The Pintner-Cunningham Primary Test[1] was administered in October to both groups. An original test of number concepts was built and administered in May to all of the children.

After studying the results of the original test of number concepts, the following conclusions were drawn:

1. A planned program for developing number concepts in the kindergarten is superior to an unplanned one.

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[1]Published by World Book Company, 1938.

2. In the combined individual and group tests, the experimental group was much superior to the control group. All except two children in the experimental group exceeded the mean for the control group, and only seven children in the control group exceeded the mean of the experimental group.
3. In the group test, the experimental group was far superior to the control group in quantitative comparisons, geometric figures, terms of arrangement, fractions, and time. Forty-one children in the experimental group exceeded the mean of the control group and only ten children in the control group exceeded the mean of the experimental group.
4. In the individual test, the experimental group was superior to the control group in all of the items with the exception of the knowledge of age. All of the children in the experimental group knew their age, and all but five children in the control group. The experimental group scored higher in the knowledges of address, calendar, and identification of money and stamps, particularly the latter. All except three children in the experimental group exceeded the mean for the control group, and only three children in the control group exceeded the mean of the experimental group.

5. In the combined individual and group tests the sex differences in achievement in the experimental group were not statistically significant. Seventeen boys exceeded the mean for the girls and eight girls exceeded the mean for the boys. The slight difference is in favor of the boys.
6. In the combined individual and group tests the sex differences in achievement in the control group were statistically significant. All but four girls in this group exceeded the mean for the boys in the group. Only three boys exceeded the mean for the girls. The girls and boys in the control group had no planned program in number concepts, yet the girls were far superior to the boys in the control group.

CHAPTER V

SUGGESTIONS FOR FURTHER RESEARCH

1. Conduct a similar study with a larger population.

2. Administer the test in September and again in June to compare the scores.

3. Compare the mental and chronological ages with the test scores.

4. Do an item analysis on the test.

APPENDIX A

COMPLETE OUTLINE OF THE PLANNED PROGRAM

October

1. Free Activity

Duties

Children give milk and cracker money to teacher every Friday. They tell the name of each coin.

Children tells the name of the coins put into the Red Cross Fund.

Children in turn cut large napkin paper into quarters for luncheon napkins; also large paper towels into halves.

Children mix paste. They measure one half cup of water and three tablespoonfuls of powder.

Materials

Puzzles introduced - four pieces

Sticks - four different lengths

Patterns - draw around leaf patterns and animal cutouts

Blackboard drawing - only three children may use the board because of its size.

Number cards of vegetables and fruits with numbers to ten. The children count the number of objects on the cards.

2. Morning Circle

Prayer - Two Little Eyes

Attendance - child counts number present and absent. Number recorded on the board.

Milk Record (Friday only) - child counts those to have milk the following week.

Milk and cracker money counted at the end of each month when the bills arrive.

Songs

Stairs - up, down

A Birthday Song - five years old

Red Leaves and Yellow Leaves - high, far

Red Leaves falling - down, over, all

Pumpkins are Gay - day, night

Come Little Leaves - summer, days, down, one, all

Witches - tall, big

I Haven't a Penny - two, penny, dime

Birthday observance

Birthday badge - five pieces of different colored paper with name and age printed on it.

Children form circle (cake) and five children are chosen for candles. The cake is divided

Introduce the Calendar - month, year, days of week, number of days in the week, number of schooldays

Draw calendar on board first day of month - compare with wall calendars (Date and weather inserted every day.)

Place birthdays on calendar.(child puts name and cake with the number of candles on it)

Place holidays or special days on calendar.

(Columbus Day, Hallowe'en)

Last day of month - children count number of rainy days and sunny days in the month.

Vocabulary - today, yesterday, tomorrow, next week

Introduce the clock - toy clock kept on shelf within the children's reach.

A child fixes the clock every hour and rings it.

Teacher sets the clock ahead to show when a period is to stop. Later a child may do this.

3. Rhythms

Falling Leaves - some children are leaves, others are trees.

Squirrels - one group of children are squirrels, another are those who feed the squirrels.

Football skip - high kicking

Gallop - pairs of children (horse and rider)

Jumping - a certain number of times

Walking - taking a designated number of steps

4. Lunch

Sometimes children are called in groups to get their milk.

5. Work

Blocks - house, store, barn, wagon, truck, train

Plasticene - animals, trees, leaves, fruits, vegetables

Drawing - pumpkins, leaves, trees, Hallowe'en cats

Columbus' three ships - three sizes - show distance

Painting - water color (mural for border - measure depth)

Paint trees of different sizes

Paint leaves - note form, and number

Introduce poster painting - six colors used

Two children only work at easel - left to right strokes

Paper

Folding - envelope (find center to fold in corners);
picture frame (fold back corners from center)
basket - 16 square or oblong fold

Parquetry - paste cats and pumpkins on fence

Cutting - cats and pumpkins for Hallowe'en game
(count number made to find out if enough)
tails for donkey game - note numbers on tails

6. Games

Knocking at my Door - child hides eyes and listens to the number of knocks at her door (chair)

Looby Loo - right, left, in, out, around, two, about

Lollipops - six paper circles (sell each lollipop for a penny)

If your Eyes are very blue - any number can play - at end take partners and skip

Block Relay - child places certain number of blocks in two squares or circles (children finish first, second, third)

Pin the Tail on the Donkey - nearest place wins-also note the child farthest away - numbers noted on each tail

Hiding Game - cats or pumpkins placed about the room - children collect as many as they can find and then count them - note the largest number found, the smallest number -also most, least, as many as (comparisons)

Follow Directions - bring one pencil and one pair of scissors (increase number of articles)

Language game - riddles (compare children or objects in room)

as tall as	as long as
as small as	as many as
as big as	as wide as
as short as	as heavy as

7. Story

A Penny for Candy

I Had a Penny

The Red House with No Doors

The Three Pumpkins

The Cat and the Pumpkin

Animated Number Book

Snipp, Snurr, Snapp and the Gingerbread

8. Poetry

Choosing Shoes - pair

The Cat - four legs, up, down, high, long

The Squirrel - up. around, down, tall, broad, in, out

9. Nature Study

Plant narcissus bulbs - count bulbs and note day planted on the calendar.

Plant pumpkin seeds - count seeds as they are planted in egg boxes.

10. Picture Study

Number picture dictionary

Pictures of Columbus' ships, the harvest

Health pictures - care of teeth and hands - bedtime

11. Dance - clap, clap, clap - number to three

12. Other Activities

Physical Examination - weight, height

Excursion

Collect leaves, milkweed, nuts

Buy pumpkin

Note prices of groceries

Note weight and price of pumpkin

Send card to sick child - 3¢ stamp placed on envelope and mailed

Children's Leads

Pumpkins (three different sizes) contributed

Toy watch

Animated Number Book

Donkey Game (tails to be cut out by the children)

Dates cut out of newspapers and pasted on the calendar.

November

1. Free Activity

Dramatic play - grocery store constructed of blocks

Drawing and cutting figures and groceries for the store

Plasticene - fruits and vegetables

Tablets - square, circle, triangle

Number Cards

2. Morning Circle

Songs - a child chooses a number of children to select songs

This is November - month, holiday, Thanksgiving

An Order by Phone

The Tambourine - form, number

The Butter Churn - number

The Big Tall Indian - number, size

We are Little Indian Boys - number chosen to dramatize

Calendar

Voting Day, Armistice Day, Thanksgiving, Butter Party,

Birthdays - count the number of days to the holiday and the party.

Vote for Governor - each child places a cross beside the desired candidate and children note the largest vote.

Count cans of food contributed for poor at Thanksgiving.

Set up farm of cardboard buildings and animals - number

Decide on invitation for the party - time and day of week

Measure growth of bulbs and seeds

3. Rhythms

Indians - tiptoe, running, stalking - three kinds of music

Gallop - two horses pull farm wagon

Harvesting - some children play the farmer's family and others put the hay into the barn.

4. Work

Blocks - measure space available to keep buildings for play

Plasticene - figures and groceries in proportion to size of store

Paper

Drawing - label pictures and include any number in them.

Price tags and signs for store

Folding - Sixteen oblongs for hay wagon (4 wheels and 4 brads to attach wheels)

Sixteen oblongs for barn and square paper to make cylindrical silo.

Boxes for groceries - count number made

Bags for sugar, flour - count number made

Indian hats - oblong paper folded twice (cut 8 feathers)

Painting - Indian drums of oatmeal boxes (form, depth)

5. Games

Language - "same" and "different" - teacher touches two objects and child tells whether they are the "same" or "different".

Ring Toss - three rings - measure distance from stake with yardstick

Three Billy Goats - three sizes - over, long

Ten Little Indians - start with ten and go down to none - then build up to ten

Play Store - use phone, money

O! Tell Me What You Have To Sell - a number of things to sell - note number sold and things left-over.

Fruits, vegetables in row on the floor - one or two are removed while a child blindfolds, then tells objects gone, also the number of objects gone.

Relay Race - half of the class of girls compete with the other half - also the boys (ordinals - next, last)

Bean Bag - a board or floor target (square or circle)

6. Story

Write story of visits to farm and store including number.

The Animals of Farmer Jones - size, number, time

Anybody at Home - size, number,form

Feed the Animals - size

Where's My Baby? - size

Chicken Little, Count to Ten

The Story of Collette - number

Quiz - How do you buy milk? eggs? oranges? cream? ice cream? butter? ribbon? coal? gas?

7. Picture Study - Indians, Puritans, farm - number, time

8. Dance - How Do You Do My Partner

9. Toy Orchestra - a certain number of children play each instrument

Sticks play every beat.

Drums play once in every measure.

Jingles play every beat.

10. Other Activities

Excursions

Barn - size of animals and number of them

Store - buy apples for Thanksgiving feast - price and number needed for class

Note house under construction - count windows, note height, length of building

Children note own homes and their distance from the school.

Butter Party - count number attending

Liquid measure - quart, pint, half pint jars

Measure butter milk obtained

Weigh butter

Thanksgiving feast

One group dressed as Indians and the other group as Pilgrims

Trip to see parents voting in booths on first floor.

Children's Leads -

Book - Animals of Farmer Jones

November Calendar

Hay - enough for every child's wagon and some left-over for the barn of blocks

Cans of vegetables and fruits for the poor

Indian drums and hats

December

1. Free Activity

Dramatic Play - toy shop (buy and sell toys)

Puzzles - six pieces

Picture books

Plasticene - toys

Number cards

2. Morning Circle

Calendar

Christmas, Christmas Party Day, Birthdays

Count number of days to Christmas and in the vacation.

Songs

Elevator Man - up, down, first floor, second floor

I can light a Candle - day, night

Three Shepherds - number

Three Wisemen - number

Use telephone - csll Santa

Find number of department store in directory.

Consult newspaper for time of store opening.

Set toy clock to time of opening.

Call store and choose children to talk - each child gives age, name, birthday, street address to Santa.

Discuss Christmas - earning money to buy presents (what can be bought with a nickel and with a dime)

Set up Manger scene - count number in scene.

Count absentees to be sent Christmas cards.

Temperature - first frost and first snowfall

Vote for children to participate in pageant - also the children to be Santa and eight reindeer. (Measure reins)

Measure height of narcissus blossoms - how long it took them to grow.

3. Rhythms

Train - pay fares - distance, near, far

Spinning Top - around, down

Rocking Horse - back, forth

Airplane - high, low, wide, near, far

Jack in the Box - up, long

Bounce Ball - children in turn bounce a ball while others count the number of bounces.

Bicycle

4. Work

Blocks - toy shop (measure floor area)

Plasticene - toys, wreaths, candles, trees

Paper

Drawing - tree, fireplace, bells, toys, Santa, sleigh

Folding - Christmas tree - 6" x 6"

First fold - 2 large triangles (put one aside)

Second fold - 2 medium-sized triangles (put one aside)

Third fold - 2 small triangles - (put one aside)

Fourth fold - 2 smaller triangles - use one

Pasting - chains (note longest and shortest ones made measuring them up against each other)

Painting - water color

Wreaths and candles - number and form

Gifts for parents

Corsage of flowers of yarn - 12 in the bouquet

Desk calendar - 16 oblong fold

Gift card made for each gift

Individual corsages for children to wear at party - wind yarn around metal ring and attach red bow (count the number made to include absentees and also the young children who attend the party)

5. Games

Toys on the floor - a number of toys in row on floor from which a child takes some and the child blindfolded then guesses the toys and the number of toys missing.

Play toy shop - use real money

Play riding on the bus - use money, obtain transfers

Lollipop game - Christmas seals on sticks as lollipops - sell for a penny or a nickel

Guessing game - place penny or any coin in child's hand while child hides eyes - the latter walks to quiet music until loud music played and then stops to ask who has coin and names the coin found.

Team races - 2 boys vs. 2 boys or 3 girls vs. 3 girls - divide groups in halves

6. Story

Write story on blackboard about toy shop visit - include number

Bobbie had a Nickel

The Christmas Story

The Night before Christmas - number

Karl's Wooden Horse

7. Picture Study

Number in Christmas scenes, toys, trees

8. Toy Orchestra

Sticks, jingles, bells, triangles, drums tambourines

9. Other Activities

Excursion - walk to toy shop and take the bus back

Note number of blocks to shop, also house numbers.

Prices of toys

Visit drug store - buy candy - 2 pieces for each child - some left-over

Bus fare - each child pays a nickel

Christmas Party

Each child receives a box of candy and each parent receives a gift.

Absentees sent cards which children stamp and mail.

Children's Leads

Pairs of candles and candle sticks, also stockings to use at fireplace set up in the room

Coconut sent from Florida - form, size, weight

Children lose teeth - money given to them

Child brings a transfer.

January

1. Free Activity

   Puzzles - eight pieces

   Blackboard drawing - use rulers

   Picture books

   Painting at the easel

   Number cards

2. Morning Circle

   Calendar

      New Year, Roosevelt's Birthday (March of Dimes)

   Songs

      Happy New Year

      A Clock in the Kitchen - little, tall

      The Pendulum Clock

      Tick, Tock says the Clock - day, night

      Tick, Tock - late

      Chimney and Star - close, far

      Silver Moon - high, night

      Moon and Stars - up, around

      Rocking in the Moon - both, ends

      Twinkle Twinkle Little Star - up, above, high, night

      The Tower Clock

      The Snowman - big, tall

      The Telephone - today, day

      The Giants - heavy, long, hundred miles

Conversation

New Year's Eve, midnight

Clock - schooltime, noontime, suppertime, bedtime, early, late

Moon - note pictures of moon on wall calendar

Count $3.00 to pay for doll for kindergarten.

Count number of dimes contributed for March of Dimes.

Uncle Remus movie - charge for movie for children and adults

3. Rhythms

Marching - by 2's and by 3's

Snowflakes - divide class in halves - one group are snowflakes and the other group shovel snow.

Skating - pairs

Snowman - roll snowman(child) and make snowman - throw number of snowballs at the snowman.

Giants - long steps

4. Work

Paper

Drawing - winter sports, children's figures, moon scenes, snowflakes, clock pictures, January scene (label picture - month and year).

Make a border for the room - measure depth and length

Draw around hand to make a pair of mittens.

Draw around tablets for snowflakes

Cutting - snowflakes (circle, square), count number, and paste in oblong folded book.

Clock faces (circle, square) for wrist watch, desk clock, grandfather clock

Phases of moon - quarter, half, three quarter whole circles cut and pasted

Cut long and short hands for clocks.

Folding - 16 oblong - grandfather clock

16 square - cuckoo clock

8 oblong - desk clock

Plasticene - clocks, snowman

Blocks - community built with clocks placed in buildings

Painting - water color

Moon scene - paste number of squares for windows, and a circle used for the moon.

5. Games

A lost child - a child (policeman) asks lost child name and address

Three Little Maids - multiple of 3

Ten Pins -

Pins placed in 1, 2, 3, 4 pattern.

Each child keeps score on board.

A child measures two yards from toe line to pins.

Block Relay

6 competing - ordinals through sixth

Clock game - each child has toy clock and moves hands to bedtime, schooltime, noontime, and suppertime

Snow White and the Seven Dwarfs

Musical Chairs - start with ten chairs and take one away each time the music stops playing.

6. Story

Write story of excursion through building.

Ludwig and Marlene - round moon

The Clock - importance of time

Children brought in their Christmas books.

The Valiant Taylor - number "7" - read in two parts so record page on board to begin following day.

Little Hippo - size

Miss Sniff - number, size

Mother Goose Tells Time

Telltime Rabbitt

The Child's Almanac - day, month, holiday stories

The 364 Story book - use index

The Sailboat - direction, depth

The Greedy Pig - what to buy with ten pennies

Set the Clock

7. Picture Study

Picture dictionary - number concepts and vocabulary

Pictures of clocks, different forms of moon

8. Poetry

A neat little Clock

The tall Clock in the Hall

The Moon's the North Wind's Cooky

Frozen Milk Bottles

9. Other Activities

Excursion to principal's office to see master clock - count sixty seconds to movement of pendulum and second hand.

Play -

Build snowman in the yard.

Note different forms of snowflakes.

Observe new license plates.

Children's Leads

Picture books

Toys - airplanes, trucks, helicopter

Toy wrist watch

Real watch

Calendars

Handkerchiefs - days of week

Dimes - Roosevelt's picture on them

Receive card from Florida with 1¢ stamp on it.

Children note boys dressed in twin suits.

February

1. Free Activity

Play in post office constructed of blocks.

Picture books

Number cards - valentines

Puzzles

2. Morning Circle

Calendar

Lincoln and Washington Birthdays, Edison's 100th anniversary, Valentine

Count number of days to Valentine party, also number of days in February vacation.

Paste dates from newspapers on calendar.

Clock - children attend different session so note new time school starts for them.

Count milk and cracker money - note pictures of Lincoln, Washington on coins and bills.

Attendance - send cards to absentees - 3¢ stamps

Songs

The Postman - big, upon

The Lincoln Penny

Footsteps in the Snow - before, behind

Conversation - The flag - number of stripes and stars

Salute to Flag - right hand

3. Rhythms

Marching by 2's and by 4's

Walking in Snow - high steps

Walking forward and backward

4. Work

Blocks - Washington Monument, Mt. Vernon, Lincoln Memorial, Capitol - note height of buildings, number of columns, and the shape of the roofs.

Lincoln Log Cabin - logs placed one on top of each other

Post office

Plasticene - log cabins

Paper

Drawing - log cabin, flag, valentines, postmen

Folding

16 oblong - log cabin

12 oblong - mail box (number on box for delivery)

Envelope fold with stamp on it for use in post office.

Soldier hat of oblong fold

Cutting

Valentine hats, aprons, napkins - measure for hat band

Valentines for parents and friends

Postman's cap - measure head band

Washington's three cornered hat

Pasting

Square parquetry in corners of Lincoln and Washington silhouettes

Crepe paper measured for the Valentine box

5. Games

Postoffice - buy and sell stamps (use real money)

Valentine hunt - count Valentine hearts found - most, least

Valentine lollipop game

Soldier Boy - flags distributed one by one

Fair Rosie - high, hundred years, around, far

Bean Bag - each child keeps own score

Quiet game - place coin in child's hand and another child tells what he sees

6. Story

Write story of excursion to post office.

The Lincoln Penny

George Washington's Life - surveying - number in family

How Far - use of tape measure

Mike Mulligan and his Steam Shovel

Book of Stories and Riddles - use index

Child's Almanac

7. Picture Study

Valentines - size, number

Buildings in National Capitol

8. Dance - Minuet

9. Other Activities

Physical Examination - height and weight compared with that of October

Valentine Party - setting the table, valentines counted by each child

Excursion - Post office

Bus fare - stamp and mail cards for absentees

Children's Leads

Twin log cabins

Flags

Child's Almanac

Candy bars for party - one for each child

Used stamps - 1¢, 3¢, 5¢

Child's pennies used to play post office

Book - riddles

Dates cut out of newspapers

Child observes girls dressed alike.

March

1. Free Activity

   Magnetic fish game - numbers on fish

   Work on Easter box for Red Cross

   Puzzles

   Number cards

2. Morning Circle

   Calendar

      Indicate first day of spring.

      March comes in like a lion and goes out like a lamb.

   Songs

      Pussy Willow - early, days, spring

      The Windmill - round - dramatize with pairs of children

      The Kite - high

      Sailboat - west, little

      The Wind - round, corner

      The Balloon Man - corner, money, far away, each day

   Set up Dutch village - number of windmills and people

   Discuss child's trip to Florida

      Number of weeks in Florida.

      Number of days spent on trip.

      Number of miles travelled.

3. Rhythms

   Trees swaying - side to side

   Sailing - a number of children in each boat

Blow up balloons - children dramatize - very low, very high

Windmill - pairs of children with arms out spread

Rabbits - hop with both feet at the same time

Fly Kite - high

4. Work

Blocks

Dutch village

Windmills - different heights

Dikes - different lengths

Canals - winding, straight

Plasticene - figures, sailboats, flowers for village

Paper

Folding

Windmills

Sailboats

Kites - fold, paste parquetry or draw designs on kite, measure kite string, sew on tail

Pinwheels - diagonal fold - every other one tacked down on stick

Decorate with parquetry.

Drawing

Little Half Chick, Dutch shoes , tulips, windmill, balloon man, weather vane, pussy willow (pods on alternate sides of branches)

Cutting

Measure for wind border

Weathervane rooster made of two large and two

small circles

Pasting

Balloon man - number

Tulips - form, number

Clotheslines - number

Red Cross Box

Bean bags - measure material for four bags

measure one half cup of beans for each bag

Pinwheel

Picture book - pictures placed on pages equal distance from edges.

Drawing book - fold oblong paper in half

Easter hat - crepe paper circles and streamer measured

Suitcase of paper dolls - 16 oblong fold

Corsages - 12 flowers of yarn - 8 corsages

5. Games

Measure the distance each child jumps

Balloon man on the corner - sell balloons using pennies

Show child four balls; then blindfolds. Separate balls and show some of the balls in one box. The child guesses the correct number in the other box. Numbers to 7.

Ten Pins - keep score

Bean Bag - keep score

London Town - a bridge of six pairs and pennies used

Pinwheel Game - call different colors; then count each group

Little Sally Waters - directions called out

Up the Hill - up, down, top, bottom, round, inside

6. Story

Write story of excursion

Little Red Hen

Little Half Chick

Happy Hour Stories

The Restless Robin - number, distance, seasons

The Dutch Twins

7. Poetry

The Balloon man - between, big, small, high, below

8. Picture Study

Holland, wind, spring, flowers, rabbits

9. Other Activities

Excursion - early spring flowers and weathervane

note forms of flowers and the number of petals

Children's Leads

Record - Little Red Hen

Two pairs of Dutch shoes

Twin Dutch dolls

Child's dentist appointment on calendar

Magnets

Jump rope

Gift of oranges from Florida

April

1. Free Activity

   Dramatic play - fire station

   Puzzles

   Blackboard drawing - rabbits, ducks, chicks - number

   Number Cards - Easter pictures

2. Morning Circle

   Calendar

      Easter, number of days in vacation

   Songs

      Be of Cheer - Easter

      Pretty Bunny - big, long

      The Rabbit - long, short, little

      Easter Time - winter, at last, spring

      Sunshine - day, night

      Here is the Sunshine - low, high

      Snowflakes and Winter Winds - groups dramatize it

      Robin - high, three

      The Frog - in, out

      The Firemen - up, back, edge

   Count crocuses brought in by child - number of petals

   Plant flower seeds in flower pots - Mother's day

   Read "thank you" note from The Red Cross - note stamp and date

3. Rhythms

   Ducks and chicks - number in single file

4. Work

Paper

Drawing - label pictures with number of chicks, ducks and rabbits

Folding - Easter card - oval shape

Easter basket - 16 square fold

Fire Engine - 16 oblong fold

2 ladders, 2 headlights, 4 wheels

measure hose and attach license plate

Pasting - cutting circles for Easter tulip border

Painting - color Easter cards

paint Easter eggs - 2 dozen

paint paper crocuses

Cutting - Easter animals and eggs for border

Robins - pairs of wings

Blocks

Church - height of windows, doors and length of pews

Fire Station - width of doors and number of engines

5. Games

Easter egg hunt - count number of paper eggs found

The Grass is Green - certain number of boys and girls chosen by ordinal counting - every third child

Ten Rabbits - taking one away at a time

Springtime is Here - partners

6. Story

The Country Bunny - number

A Tale of Easter - time

The Golden Egg - form

Peter Rabbit - number

The Story of Colette - number

The Fire Station

Bingo

The Fire Boat

The Root Children

7. Poetry

The Barber's - down, straight, above, round, over, under

Rabbits - up, down, inside, three

Trains - over, thousand

Engine - down, back, fifty

8. Picture Study

Easter, spring, rain, flowers, birds

9. Dance

Right foot, Left foot

10. Orchestra - divide class in halves - audience, players

Children's Leads

Book - The Pink Bow - the bow was found at the bottom of the box.

Many different sized paper rabbits

Toy fire engine

Jig saw puzzle

Spring flowers

Flowerpots

May

1. Free Activity

Play in library; later in circus ring of blocks

Puzzles - circus animals - eight pieces

Picture books

Blackboard drawing - circus panorama - number

Number cards

2. Morning circle

Calendar

Mother's Day, May party, Memorial Day, birthdays

Songs

The Cups of Tulips

Bluebird - high

My Garden Bed - over, first, round, higher

dramatize with children as seeds, raindrops, sun

The Clown

The Elephant - right foot, left foot

The Tiger - round

The Monkey - high

A Cowboy - over, back

Read letter to be mailed to librarian - stamp it

Observe growth of seeds for Mother's Day gifts

Set up circus of cardboard - count number of acrobats, clowns, animals

3. Rhythms

Circus animals

Tiger - walking back and forth

Elephant - straight back and head up

4. Work

Blocks - library with librarian's desk shaped in a half circle - book shelves (top, middle, bottom - ordinals)

Circus ring - number of rings within, rows of seats, height of trapezes

Plasticene - figures of people and animals

Paper

Folding

Books for library shelves

Mother's Day cards and party invitations

May basket - fold into 8 triangles - cut 6 times

Circus wagon - large oblong into 4 small oblongs and cut out strips

Clown hat - cone shape

Drawing

Flowers, garden, children at play, swanboats, Maypole

Circus animals, clowns - designs for elephant blanket

Pasting

Flowers on party hats - crepe paper circles

Cutting

Figures and flowers for May border

Maypole streamers, flower hat strings, party capes

Painting

Flower hats - circles

5. Games

Dance So Merrily - one by one the children take partners as turn comes and at the end form small circles.

Going to Circus - divide class in halves - audience and circus participants

Going to Library - children bring books to library and child librarian stamps them

Mother, Mother, May I Go - three or four mothers choose a number of children and dance together

6. Story

Picture dictionary

Number cards to ten - associate word, number, picture

Write story of library excursion

Wait for William - number, size

How Big? - size, form, number

Manuela's Birthday - number "5"

Make Way for Ducklings - number "8"

Circus Panorama - size

Little Black Sambo - number

The Little Gardeners - number, time

I Spy - number

Talk - care of books and how to find page

7. Poetry

   The Clown - up, down

   The Monkeys and the Crocodile

8. Picture Study

   Flowers, garden, circus

9. Dance

   Maypole - 16 dance at one time

10. Other Activities

   Eye examination - measure distance

   Excursion - library - bus fare

   May Party - buy refreshments - number, money

June

1. Free Activity

   Play in doll house

   Blackboard drawing - cross section of rooms in a house

   Puzzles - jigsaw

   Matching number game

   Number cards

2. Morning circle

   Calendar

      Flag Day, Father's Day, June 17, Promotion Day

   Songs

      The Organ Man - monkey has pennies

      Fireflies - night, round, about

      The Hill - big, high, up, top

      The Swing - up, down

3. Rhythms

   Review rhythms played during the year.

   Swing - partners

   Seesaw - up, down

   Playing marbles - number

   Jump rope

4. Work

   Blocks - figures, furniture in doll house

   Plasticene -

   Paper

      Folding

         Bird Book - number pages

Furniture - 16 square fold

Drawing - birds, flowers, flag, wall paper, rugs
use tablets and in the enclosures draw
flowers in number sequence to twelve

Cutting - measure material to sew rag dolls

5. Games

Number Dodge

Block relay - children wear numbers in racing

Bean Bag - child writes score if able

Ten Pins - child writes score

I wish I had a Needle - two lines of children

Garden Gate - class divided into groups of four each

6. Story

Flicka, Ricka, Dicka and the Girl Next Door

Animated Number Book

Buddy's Adventures in Blueberry Patch - number

Manuela

7. Poetry

Foreign Lands - up, down, higher, farther

The Swing - up, down, over, wide

Merry Go Round - up, down, around

Some One - left, right

Twenty Foolish Fairies

8. Picture Study

Birds, houses, furniture

9. Orchestra - all instruments - different timing

10. Other Activities

Candy making - measuring cups, spoons

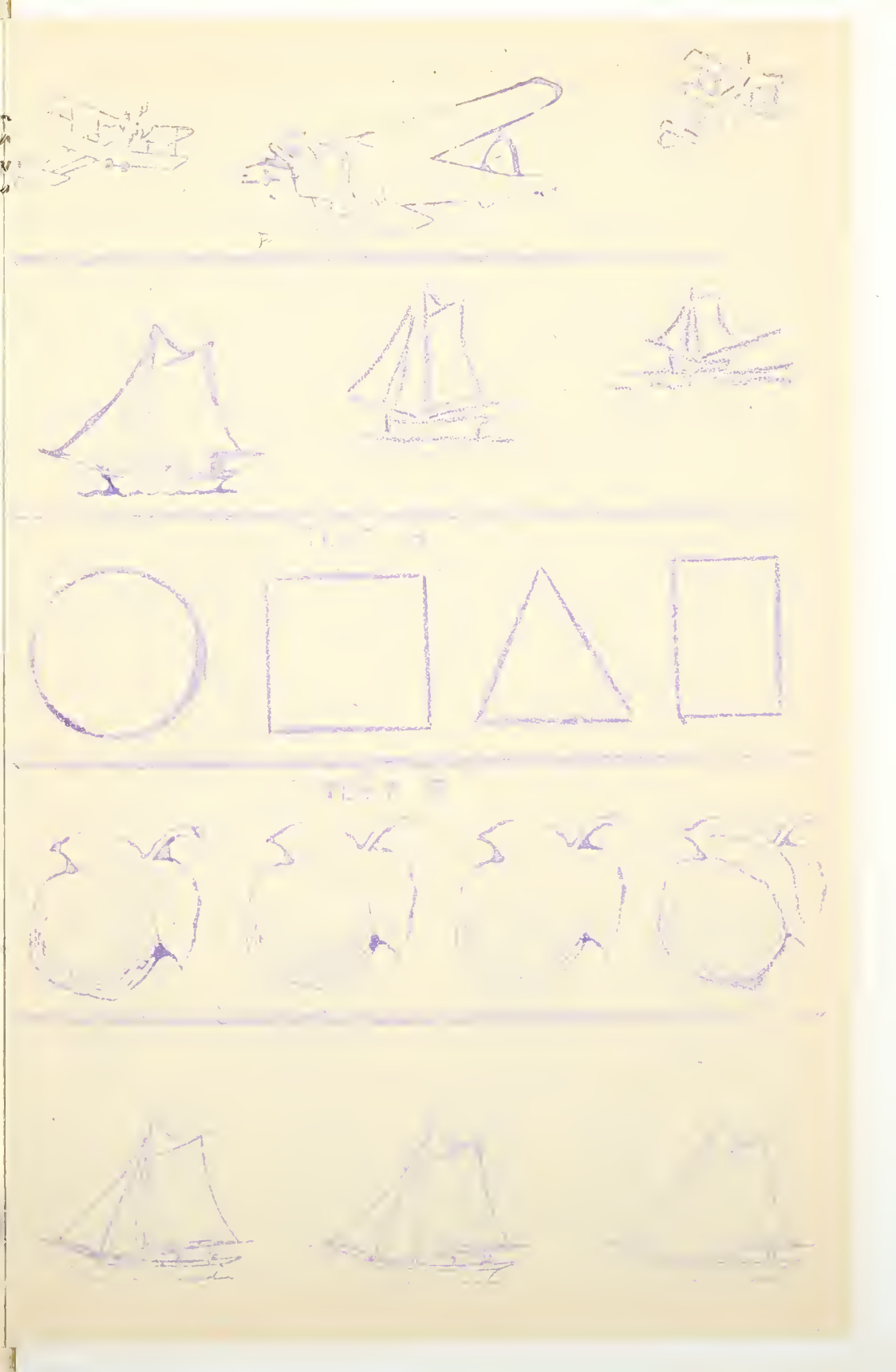
Flag Day ceremony

Doll collection

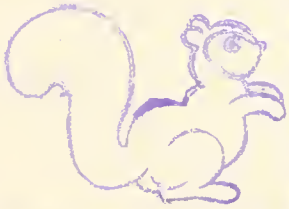
Blow Bubbles - largest, smallest, highest, lowest

APPENDIX B

ORIGINAL ARITHMETIC READINESS TEST WITH DIRECTIONS FOR ADMINISTERING AND SCORING

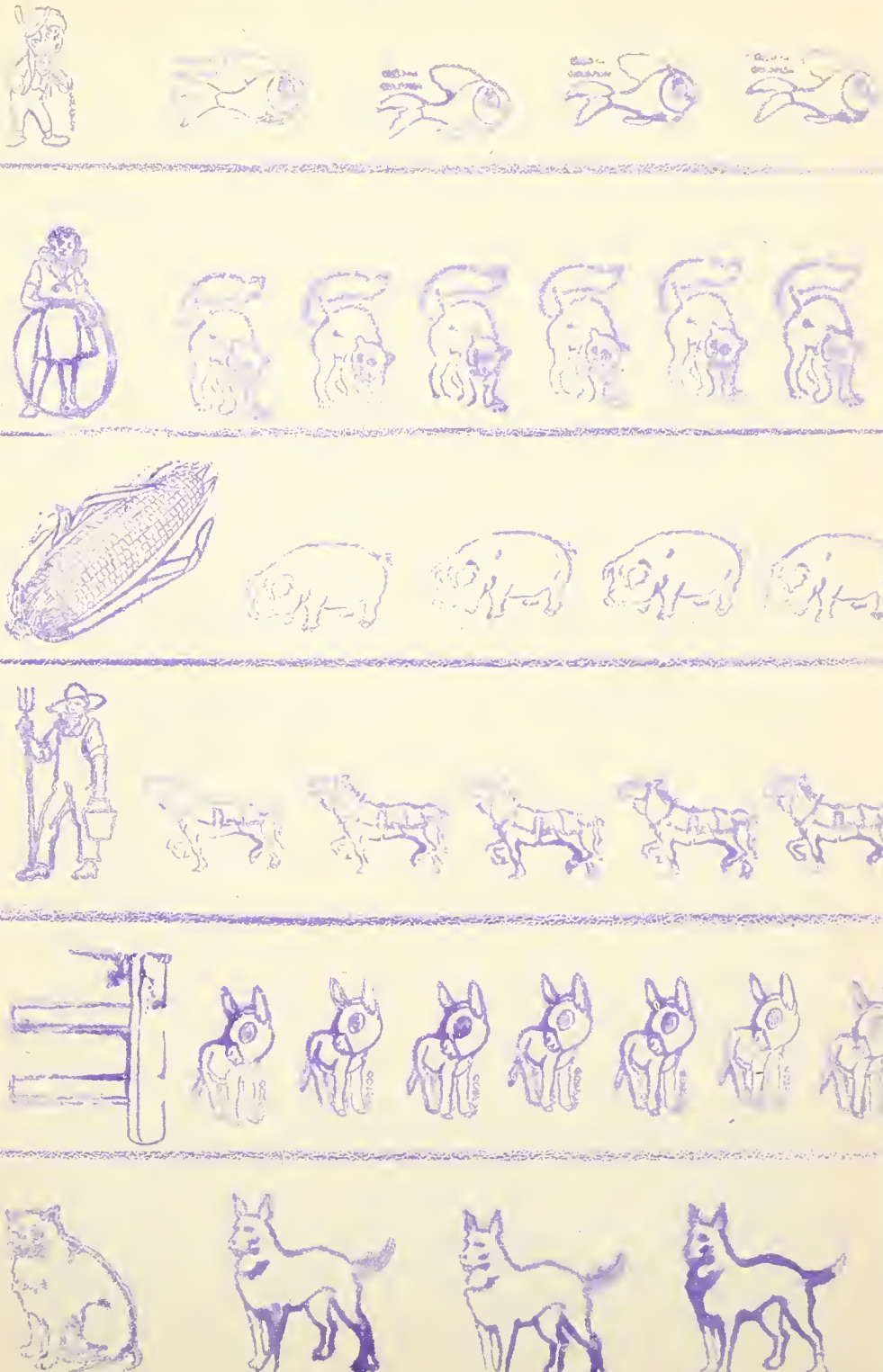


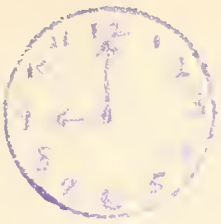
TEST 6

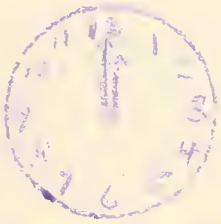


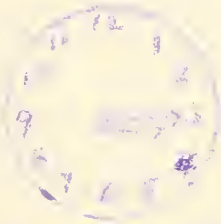
TEST 7

TEST 8









DIRECTIONS FOR ADMINISTERING ARITHMETIC READINESS TEST

Part I - Individual Test

The child is seated comfortably at a table in a quiet room.

"Do you like to play games? We are going to play a game. I shall ask you a question and you will tell me the answer.

"What is your name?

Where do you live?

How old are you?

When is your birthday?

What day is today?

How many days are there in the week?

Let me hear you count to twenty.

What are these? (pennies)

Let me hear you count all of them.

What is this? (point to each coin)

Which stamp do you put on a postcard? How much does it cost?

Which stamp do you put on a letter? How much does it cost?

Which stamp do you put on an airmail letter? How much does it cost?"

Part II - Group Test (12 children)

Each child needs a copy of the test and a pencil.

"We are going to play a game today. Listen carefully. Open your books and fold the page back so that you can see the soldiers marching."

Test 1 - Identification

Mark the five soldiers marching together.

Mark the boy with the seven balloons.

Mark the picture of the ten stars.

Test 2 - Reproduction

Draw six windows in the house.

Draw eight candles on the birthday cake.

Draw nine balls beside the girl.

Test 3 - Quantitative Comparisons

Mark the ball that has the most stripes.

Now turn over your book and look at the row of fences.

Mark the longest fence.

Mark the shortest pencil.

Mark the widest board.

Which is the deepest, the box or the wastebasket?

Mark the deepest.

Draw a line as long as the pencil.

Mark the two animals that are the same.

Mark the animal that is different.

Now turn the page and fold it back so that you can see the clowns.

Mark the clown that has more balls than the other clown.

Mark the hen that has less eggs than the other hen.

Mark the largest elephant.

Mark the smallest horse.

Mark the tallest tree.

Now turn over your book and look at the airplanes.

Mark the nearest airplane.

Mark the boat that is farthest away.

Test 4 - Geometric Figures

Put a dot in the center of the circle.

Put a line under the square.

Put a line over the triangle.

Put a cross on the oblong.

Test 5 - Terms of Arrangement

Mark the apple on the right.

Mark the sailboat on the left.

Now turn the page and fold it back so that you can see the table with three shelves.

Draw a circle on the middle shelf.

Draw a square on the top shelf.

Draw a triangle on the bottom shelf.

Test 6 - Exact Comparison (matching)

See the squirrel with the nuts. Put as many nuts under this squirrel (pointing to second squirrel) as there are under this squirrel (pointing to first squirrel).

See the kite with the tail. Put as many lines on the tail of this kite (pointing to second kite) as there are on this kite (pointing to first kite).

Test 7 - Fractions

Draw a line to cut this apple (pointing) in halves.

Draw a line to cut this apple (pointing) in quarters.

Look at the row of flowers. Draw a line to show half the flowers in the row.

Look at the row of dolls. Draw a line to show half the dolls in the row.

Now turn over your book and look at the boy with the fish.

Test 8 - Ordinals

Mark the third fish from the boy.

Mark the fifth cat from the girl.

Mark the second pig from the corn.

Mark the fourth horse from the farmer.

Mark the sixth donkey from the fence.

Mark the first dog from the cat.

Now turn the page and fold it back so that you can see the clocks.

Test 9 - Time

Look at the two clocks in the top row. Mark the clock that tells us when we are in school.

Look at the two clocks in the next row. Mark the clock that tells us when it is noontime.

Look at the two clocks in the next row. Mark the clock that tells us when it is bedtime.

Test 10 - Value of Money

Look at the pictures of the book, the lollipop, and the ball. Mark the one you can buy with a penny.

Look at the pictures of the doll, the toy airplane and the ice cream cone. Mark the one that you can buy with a nickel.

Now turn over your book and look at the pictures of the rabbit, the toy flag and the Christmas tree. Mark the one that you can buy with a dime.

Test 11 - Measure

Put a ring around the half pint bottle.

Mark the quart milk bottle.

Put a cross on the pint bottle.

Mark the dozen eggs.

Test 12 - Number Combinations

Addition

Listen carefully while I tell you a little story. If you had two books and you bought one more, mark the books you would have then.

Here's another story. If you had three dolls and you bought two more dolls, mark the dolls you would have then. Now turn the page and fold it back so that you can see the row of marbles. Listen to this story.

If you had three marbles and someone gave you three more, mark the marbles you would have then.

Subtraction

If you had three balls and lost one ball, mark the balls you would have left.

If you saw four squirrels and two ran away, mark the squirrels that would be left.

If you saw five dogs and one ran away, mark the dogs that would be left.

That's the end of our game. Please turn your book back to the first page where you can see your name and address.

DIRECTIONS FOR SCORING ARITHMETIC READINESS TEST

Part I - Individual Test

One point is given for each item with the exception of the question about the birthday. In this case, one point is given if the child tells the correct month, and two points if the child tells the correct month and day. Credit is given only when the child counts as far as twenty without any mistakes.

The total score is 16.

Part II - Group Test

One point is given for each item with the exception of Tests 4 and 5.

Test 4

Item	Score
Circle	
Identify form	1
Term "center"	1
Square	
Identify form	1
Term "under"	1
Triangle	
Identify form	1
Term "over"	1
Oblong	
Identify form	1
Total	7

Test 5

Item	Score
Term "right"	1
Term "left"	1
Terms "top", "middle", "bottom"	3
Forms circle, square, triangle	3
Total	8

The total score for the group test is 64. The score for the whole test is 80.

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